

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

SUBJECT: COMPREHENSIVE PEDESTRIAN CROSSING POLICY
POLICY NO.: 200-07
EFFECTIVE DATE: April 23, 1990

PURPOSE:

The purpose of this policy is to provide a comprehensive, systematic and progressive set of guidelines for handling pedestrian crossing needs; and to provide for the optimum level of safety and mobility for both pedestrians and motorists* on city streets.

PROBLEM STATEMENT:

In urban areas a problem presents itself in providing for the safety and mobility of pedestrians and motorists alike.

In terms of mobility, there is an inherent degree of equality between pedestrians and motorists. Each has certain latitudes to use and share the public right-of-way. This is further reinforced by the recognition that as soon as motorists or passengers step outside a vehicle they become "pedestrians."

By contrast, in terms of safety, equality does not persist. Vehicles have more mass, move faster, do not stop as quickly and, in terms of protection, the pedestrian does not fare as well as the motorist (this is not to ignore the occasional rear-end accident precipitated by a pedestrian in which the motorist becomes the victim).

Pedestrian accidents account for only four percent of the total traffic accidents in the City of San Diego. Unfortunately, they also account for a disproportionate 34 percent of all citywide traffic deaths.

Pedestrians are at more risk than motorists. The problem is how to lessen that risk. The solution lies in a combination of education, enforcement, engineering and good community planning.

Education techniques, such as "defensive walking" instructions, help pedestrians avoid conflicts with motorists. Similarly, "driver education" programs help sensitize motorists to the needs and rights of pedestrians.

Enforcement techniques are effective in reaching chronic traffic violators among motorists and pedestrians, as well as reminding all of us to obey traffic regulations. Aggressive prosecution of violators helps to reinforce the respect for the rights and responsibilities of motorists and pedestrians alike.

Engineering techniques provide a number of strategies and countermeasures to improve pedestrian and motorist safety and mobility.

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

Good community planning techniques help provide an environment to minimize conflicts between pedestrians and motorists.

These guidelines will focus on examining engineering techniques and will attempt to resolve the basic dilemma: "As pedestrian and vehicular traffic progressively increases, the opportunity for conflicts and accidents also increases."

*NOTE: The term "motorist" as used in this policy is also intended to include the operations of "non-motorized vehicles" such as bicyclists.

GUIDING PRINCIPLES:

In an effort to lessen the number of conflicts and accidents involving pedestrians and vehicles, it is useful to examine several principles governing the use of "right-of-way" as it applies to pedestrians and motorists. These principles not only apply to traffic conditions but also to the way society, in general, handles problems involving conflicts between opposing viewpoints and opposing needs. These principles can be described briefly as follows:

1. Principle of Majority Rule: "The greatest good for the greatest number."
2. Principle of Fair Play: "The needs of the minority must also be considered."

In resolving traffic problems, these principles take on the following forms:

"Priority goes to the greatest number of users."

Thus, freeways are constructed for the exclusive use of motorists. Similarly, traffic signals are usually timed to favor the heavy vehicular flow on major streets vs. the lighter traffic flow on the side streets.

The principle of fair play takes on several forms.

"Other users should not be denied reasonable access and mobility on the overall street network."

Thus, freeways do provide pedestrian bridges and grade separation structures to facilitate travel on the surface street system by pedestrians and non-freeway motorists.

"Other users should not have to wait an undue period to use a facility, nor should one using the facility expect to unduly delay others."

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

This is exemplified by the fact that traffic signals, even on heavily traveled streets, have "pedestrian push buttons" which not only stop heavy vehicular traffic flow for a single pedestrian but also provide extra time for the pedestrian to cross the street. At most locations, pedestrians seldom have to wait more than 60 seconds before getting the "walk" signal.

3. Principle of Orientation: To guide community development to provide the most effective means of pedestrian travel and access. Proper planning, design, layout, orientation and implementation of projects can help provide a safe and desirable pedestrian environment for both short-term and long-term needs. Emphasis needs to be placed on designs and pedestrian amenities that reduce or eliminate conflicts between pedestrians and vehicles.

IDENTIFIED PROBLEM:

The terms "identified problem" or "demonstrated problem" as used in this policy mean a problem identified by citizens or City staff and verified by traffic engineers on a factual basis either by means of accident analysis or field observations and studies.

PROGRESSIVE CHOICES:

The following array of countermeasures will be examined in detail to provide a progressive ladder of choices that may be utilized to resolve increasingly complex interactions between pedestrians and motorists.

1. curb clearance ("no parking" zones)
2. landscape trimming
3. signs and markings
4. lighting
5. marked crosswalks (complete installations)
6. flashing beacons
7. stop signs
8. traffic signals
9. separation structures
10. shared pedestrian/vehicle facilities

In addition, special needs must be considered:

- a. school children
- b. senior citizens
- c. disabled citizens

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

- d. transit stops
- e. pedestrian/commercial overlay zones (PCOZs)
- f. community planning and "General Plan" guidelines
- g. project orientation and design

CURB CLEARANCE ("NO PARKING" ZONES):

There are over 17,000 intersections in the City of San Diego. Many of these locations do not have a problem with parked vehicles blocking the view of traffic control signs or blocking the view between pedestrians and approaching motorists. However, if there is an identified problem where parking may be restricting the view between motorists and pedestrian crossing at an authorized crossing location (intersection or mid-block) then it is appropriate to provide "curb clearance" by installing red curb or "no parking anytime" signs to improve the interface between pedestrian and motorist. The extent of the clearance depends upon approach speed, road alignment and degree of visibility needed.

LANDSCAPE TRIMMING:

Where there is an identified pedestrian visibility problem involving landscaping, the existing trees or shrubbery may be trimmed or removed by City forces to improve sight distance. If such landscaping is on private property, the owner or tenant should be contacted and advised to take appropriate action to trim or remove landscaping as necessary.

SIGNS AND MARKINGS:

Special pedestrian signs and pavement markings "PEDS" may be installed in advance of pedestrian crossings at relatively confined locations or randomly over a substantial distance. Signs and markings may also be used in isolated areas where pedestrian crossings are unexpected and advance warning to motorists is desirable. The following urban guidelines are recommended:

- + There should be an identified pedestrian crossing problem.
- + Roadway should be classified as a through street.
- + Vehicular volume should be greater than 10,000 ADT.
- + Pedestrian crossing volume should be greater than 10 pedestrians during the peak pedestrian hour.

LIGHTING:

The City of San Diego employs three methods of street lighting:

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

- (A) Safety lighting,
- (B) Residential and commercial continuous street lighting districts,
- (C) Traffic control continuous street lighting.

The City has existing policies which govern the installation of lighting on the public right-of-way and the needs for pedestrian safety.

For locations where there is an identified nighttime pedestrian crossing problem, it is recommended that safety lighting standards be employed. Additional lighting throughout commercial areas where high levels of pedestrian activity can be expected may also be desirable.

MARKED PEDESTRIAN CROSSWALKS:

Marked pedestrian crosswalks and warrants are described in greater detail on pages 16-25. Marked crosswalks are useful as a means of channelizing pedestrian traffic into desirable paths of travel across streets at appropriate intersections or mid-block locations. However, because some pedestrians may place undue reliance upon the markings to stop traffic, it is important that marked crosswalks be used and installed with special consideration to the following factors.

A. Locations must meet all of the following basic warrants:

1. Pedestrian Volume must be equal to or greater than ten pedestrians per hour during the peak pedestrian hour. Children under 13, elderly over 64 years and/or disabled persons count as 1.5 pedestrians.
2. The 85th Percentile Approach Speed must be less than 45 MPH, as determined by approved engineering speed study techniques.
3. Visibility Conditions must be such that motorists have an unrestricted view of all pedestrians at the proposed crosswalk site, for a distance greater than 200 feet approaching from each direction. Sites with grades, curves and other sight restrictive features will require special attention.
4. Illumination: Proposed crosswalk site must have adequate crosswalk lighting in existence or scheduled for installation along with the installation of the crosswalk.

B. Point warrants:

See pedestrian crosswalk warrants for additional considerations involving street width, traffic volume, safe crossing gaps, and general conditions influencing possible placement and installation.

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

It should be emphasized that a satisfactory and complete marked crosswalk installation should include not only the crosswalk markings but also adequate curb clearance, advance warning signs and pavement markings, and safety lighting.

FLASHING BEACONS:

Flashing beacons may be useful at identified problem locations where approaching motorists need to be alerted to unexpected pedestrian crossing activity, such as at certain mid-block crosswalks and school crossings. Typically, they are used in advance of traffic signals or stop signs where there is limited approach visibility due to sharp curves, grades, or obstructions on or near the road. Section 9-50 of the State Traffic Manual cautions that "...the effectiveness of flashing beacons has not been consistent from one location to another," and suggests that decisions on their use may involve other considerations. Some factors to consider include approach speed, horizontal and vertical alignment, other unusual site characteristics. Flashing beacons are supplemented with other appropriate signs, such as "PED XWALK" signs, and pavement markings. If the problem occurs only during limited time periods, such as "quitting time" at an industrial plant, then the flashing beacon may be controlled and activated only when needed.

STOP SIGNS:

Criteria for the installation of stop signs is covered by Council Policy Number 200-08. Although pedestrian traffic is one of the factors used in evaluating the installation of two-way and all-way stop signs, these traffic control devices are used primarily to establish vehicular right-of-way at intersections rather than to facilitate pedestrian crossings. It should be noted that all-way stops with high vehicle entering volumes are adversely affected by heavy pedestrian traffic (100 Peds./Hr.+). Where there is an identified intersection accident problem involving pedestrians or vehicles, and the intersection is found to qualify for traffic signal installation within 18-months, all-way stops may be used as necessary as an interim countermeasure prior to signalization.

TRAFFIC SIGNALS:

Criteria for the installation of traffic signals is covered by Council Policy Number 200-06, which sets forth ten warrants. The minimum criteria are satisfied when any one of the ten warrants is met. In examining pedestrian crossing needs, warrant number three (3), "the minimum pedestrian volume warrant", is of particular interest. This warrant has three conditions:

- a. The pedestrian volume per hour crossing the major street in the highest-volume crosswalk for any 8-hours of an average day must be:

150 pedestrians on urban streets, or

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

105 pedestrians on rural streets.

- b. In addition, the vehicular traffic per hour entering the intersection from all approaches on the major street for the same 8-hours must be:

600 vehicles on urban streets, or
420 vehicles on rural streets.

- c. Or, if there is a raised median island four feet or more in width, the vehicular traffic per hour entering the intersection from all approaches on a major street for the same 8-hours must be:

1,000 vehicles on urban streets, or
700 vehicles on rural streets.

Also of special interest for pedestrian signal evaluation is warrant number five (5), concerning "Accident Hazards" and warrant number seven (7), utilizing "Combinations" of partial warrants to qualify for signals. It should be noted that satisfaction of a warrant is not necessarily justification for signals since such an installation could have other adverse effects on traffic. Also, in addition to meeting the signal warrants, the candidate signal location must be evaluated and rank high enough on the signal priority list to qualify for funding under the City's Annual Capital Improvement Program. New signal installations are provided with marked crosswalks and may be financed by CIP funds, development permit funds, or other funding sources as appropriate.

SEPARATION STRUCTURE:

Criteria for the installation of pedestrian separation structures is covered by Council Policy Number 800-1. Separation structures, in the past, have either been constructed as pedestrian tunnels or pedestrian bridges. Because of a variety of problems associated with pedestrian tunnels, including crime, public nuisance, and general negative public reaction to their use over the past 20 years, all previously existing (four) pedestrian tunnels have been taken out of service and no new tunnels are anticipated. San Diego does have a fairly large number of pedestrian bridges crossing freeways and high volume surface streets. Such structures are particularly useful either at intersections or mid-block locations having high concentrations of pedestrians and vehicles, both subject to unreasonable delays or risk of accidents. Such locations, traditionally, occur near universities, industrial plants, government buildings, major shopping centers, large hospitals, recreation facilities and other major pedestrian generators. New pedestrian bridges must be wheelchair accessible with ramps, rest pads and handrails. Where possible, it is helpful to utilize differences in terrain and elevation to construct pedestrian bridges over sunken roadways. This minimizes the need for extensive ramping.

A few highlights of the Council Policy warrants are included for reference as follows, to indicate where pedestrian

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

bridges may be justified.

A. At Unsignalized Locations:

1. Major street volume exceeds 3,000 vehicles in a continuous four-hour period.
2. Pedestrian volume crossing the major street exceeds 300 during the same continuous four-hour period (children under 12 years of age are counted as the equivalent of 2.5 pedestrians).
3. The 85th percentile speed of vehicles on the major street exceeds 30 MPH.
4. An economic analysis indicates that for a ten-year period, a pedestrian bridge will be less expensive than a traffic signal.

B. At Signalized Intersections:

1. Street width exceeds 78 feet.
2. Traffic volume exceeds 35,000 vehicles per day.
3. Pedestrian volume exceeds 100 during a continuous four-hour period.

It should be noted that the above warrants may also be met at proposed development sites, based on projected or anticipated needs, where the separation structure will meet these conditions at the time of construction.

As part of the pedestrian bridge installation it may be necessary to install pedestrian barriers on the at-grade curb line as well as fencing or other constraints on the median in order to prohibit errant pedestrians from crossing the street at grade.

SHARED PEDESTRIAN/VEHICLE FACILITIES:

The concept of shared pedestrian/vehicle facilities, wherein pedestrians and motorists share the same travel space, is not new. Common examples are travel and parking areas around shopping centers and in planned residential developments, transit malls, esplanades shared by pedestrians, trams and other vehicles in recreation parks. What is new is the effort to give them a special character by means of pavers, landscaping and other innovative delineation. The "Woonerven" concept developed in the Netherlands is one of the better examples of this approach. The success of this approach is contingent upon several factors.

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

Traffic speeds must be very low.

Traffic volumes should be low.

There should be little or no through traffic.

There should be adequate nighttime illumination.

Provisions should be made for the safety and orientation of the blind to traverse the shared area in a safe and predictable manner without encountering unreasonable obstacles or diversions.

Provisions should be made for the safety of small children in the vicinity of parked and moving vehicles.

The area should be readily discernible to both the pedestrian and motorist as a "shared space."

The facility should be part of an overall planned pedestrian-oriented development.

SPECIAL NEEDS:

A. School Children:

In cooperation with the Ninth District, Parent Teachers Association and the School Traffic Advisory Committee, the City Council passed Resolution No. R-251799 on May 12, 1980, which adopted a revised set of "School Pedestrian Safety Policies and Warrants." These policies provide for the following school safety measures:

- signs and markings
- school area traffic signals
- school safety patrol
- pedestrian separation structures
- pedestrian walkways
- school area parking and loading zone controls

If it is determined that a pedestrian safety problem involves children traveling to and from school, then the "School Pedestrian Safety Policies and Warrants" should be used.

B. Senior Citizens:

Because aging is often accompanied by reduced ambulatory ability, as well as vision and hearing impairment (see also "Disabled Citizens," below), senior citizen pedestrians may not perceive hazards as readily as younger pedestrians. Similarly, because they may require more time to cross a street, their exposure to traffic is greater and their risk to accidents may be greater. For these reasons, many senior citizens adjust their lifestyles, such as where they live, and where and when they shop or travel. The City has several programs aimed at improving safety and mobility for senior citizens. For example, at signalized intersections near high occupancy senior citizens residential complexes, the City does extend the signal timing for the "walk" phase to accommodate the slower pedestrian crossing time.

C. Disabled Citizens:

Since 1975, the City has maintained a disabled citizens advisory committee ("Committee for the Removal of Architectural Barriers") consisting of persons in wheelchairs, visually impaired persons, persons with ambulatory problems, senior citizens and orientation and mobility specialists. This committee advises the City concerning the safety and mobility needs of the disabled community on the public right-of-way and in City-owned buildings. It also helps identify and prioritize projects using Community Development Block Grant (CDBG) funds. Over the years it has been responsible for the implementation and extension of a number of safety and mobility improvement programs including:

- pedestrian ramps
- Braille and tactile plaques and devices
- audible traffic signals
- building ramps and lifts
- accessible restrooms and drinking fountains
- obstacle avoidance devices (guy wires, newsracks, phones)
- tactile guidestrips and warning devices at crosswalks.

In addition, the Advisory Committee has helped the City develop its policies on "blue curb," disabled parking provisions. Also, it is currently working with the City's Traffic Signal staff in improving the layout of traffic signal equipment to make it more useable for blind and wheelchair users.

D. Transit Stops:

City staff coordinates with MTDB (Metropolitan Transit Development Board) and the Transit Corporation to help provide safe and accessible transit stops. In recent years a number of key transfer points have been consolidated at off-street transit centers which have fewer pedestrian conflicts with through traffic, thereby improving safety. Where possible, bus stops are located on the far side of an intersection to provide better motorist visibility of passengers getting on and off the bus and crossing the street.

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

E. Pedestrian/Commercial Overlay Zones (PCOZs) and other Pedestrian/Vehicle Facilities:

There are within the city a number of areas that have been identified for enhanced pedestrian use. These areas are designated as "pedestrian/commercial overlay zones". The commercial development within these areas is required to encourage pedestrian traffic along these streets. Crosswalks in these areas will help guide pedestrians to safe crossing locations and will help provide an appropriate "pedestrian-friendly" atmosphere.

F. Community Planning and "General Plan" Guidelines:

Good planning is the key to pedestrian safety. It is desirable to separate pedestrians as much as possible from high-speed, high-volume through-traffic without adversely affecting the accessibility and mobility of either the pedestrian or motorist. If possible, neighborhoods should be designed such that schools, recreation centers, libraries, shopping facilities and other pedestrian-oriented amenities do not expose pedestrians unnecessarily to traffic, nor require pedestrians, especially children or senior citizens, to have to cross at high-volume streets. Special attention should be directed at new senior citizen complexes located at multi-lane, wide and high-volume streets having transit routes. Such complexes should be designed to provide senior citizens safe access to two-way public transit and nearby shopping facilities without having to cross in traffic on busy streets.

G. Project Orientation and Design:

Development plans should be evaluated for the various pedestrian/vehicular needs. Conflict points should be identified and resolved. Continuity of pedestrian traffic flow should be given special attention as well as accessibility for disabled persons in terms of elimination of steps, excessive grades, circuitous travel or other obstacles to safe expeditious travel. Pedestrian-oriented commercial overlay districts should be given special attention toward the enhancement of pedestrian safety and mobility. Implementation programs should also be provided as appropriate.

ECONOMIC CONSIDERATIONS:

The cost of pedestrian amenities can vary widely. In some situations the cost of the countermeasure may be minor and cost itself is not the issue so much as whether the countermeasure will accomplish what it is supposed to do. In other cases the cost of the countermeasure can become a significant budget item and will require careful cost analysis and scheduling into the Capital Improvement Program, while in other cases the improvement can be made during the planning stages and implemented through development permit conditions.

In assessing the deployment of traffic control devices it is important to consider "available funding", not only for the "initial installation" but for "ongoing maintenance.". Even simple devices such as "red curbs" and pavement

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

markings require annual maintenance. Traffic signals have an initial cost of about \$100,000 and an ongoing maintenance and energy cost of about \$300 per month. These cumulative costs and available funds are important factors in determining the feasibility of installing such devices. Pedestrian bridges do not necessarily have high maintenance costs (especially those constructed with reinforced concrete). But the initial costs may be quite high, starting at about \$500,000. In determining if such capital outlays are justified it is useful to make cost benefit analysis, based on the projected 10 or 20-year cost of not doing the project vs. the cost of doing the project pro-rated over the same period (usually the life-expectancy of the facility). In evaluating accident costs it is important to consider not only the accidents that may be prevented by the traffic control device but the accidents that may occur as a result of the installation. For example, traffic signals may effect a reduction of right-angle accidents but also may result in an increase of rear-end accidents. Therefore, the net overall accident experience should be considered.

Other costs that may be considered are "delay costs" of the persons or traffic delayed (based on the premise that "time is money"), costs of stopping and starting vehicles, as well as cost impacts of emissions and pollution generated by idling and accelerating vehicles.

Table I provides some guidelines on comparative costs for installation and maintenance of various pedestrian-related traffic control devices. Table II provides progressive use guidelines.

TABLE I: TRAFFIC CONTROL DEVICE - COST SCHEDULE

TRAFFIC CONTROL DEVICE OR COUNTERMEASURE	INITIAL INSTALLATION COST	ANNUAL EXPECTED LIFE	MAINTENANCE COST
1. Curb clearance (based on 20' clearance)	\$50	2 years	\$25/year
2. Landscape Trimming	\$100	1 year is the property owner's responsibility	\$100, but often it
3. Signs & markings	\$500	Signs (5-10 years) Markings (1 year)	\$150/year
4. Safety Lighting (based on single luminaire)	\$2000	20 years+	\$95/year*

**CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY**

CURRENT

5. Complete Marked			
Crosswalk	\$3750	Markings(1 year)	\$470/year*
Installation (based on 40' wide street with curb clearance signs, markings and lighting)		Signs (8-10 years) Lights (20 years+)	
6. Flashing Beacons			
(including signs/ markings)	\$24,000	10-20 years	\$600/year*
7. Stop Signs &			
Markings (based on 4-way stop)	\$750	Signs(5-10 yrs) (4 signs) Markings (1 yr)	\$300/year
8. Traffic Signals			
	\$100,000	10-20 years	\$3,600/year*
9. Separation Structure			
	\$500,000+	20 years+	(varies)
10. Shared Pedestrian/ Vehicle Facilities			
	(varies)	20 years+	(varies)

* Includes energy costs

TABLE II: TRAFFIC CONTROL DEVICES - PROGRESSIVE USE GUIDELINES

<u>Traffic Control Device or Countermeasure</u>	<u>Pedestrian Safety/Mobility Use</u>
1. Curb Clearance	May be used on any appropriate street to improve sight distance between pedestrian and motorist where curb parking may limit visibility.
2. Landscape Trimming	May be used on any appropriate street to improve visibility where landscaping is a problem.
3. Signs and Markings	May be used on through streets to alert motorists to an unexpected concentration of pedestrians crossing the street at confined locations or randomly over a substantial

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

distance.

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|---|--|
| 4. Safety Lighting | May be used on through streets where there is a demonstrated problem involving nighttime pedestrian accidents or high concentrations of nighttime pedestrian traffic. |
| 5. Marked Crosswalk Installation | May be used where warranted, on moderate speed through streets, to channelize pedestrians into a preferred path of travel. Should be augmented with appropriate safety lighting, curb clearances, and advance signing and markings. Site visibility is important. |
| 6. Flashing Beacons
(State Traffic Manual, Section 9-50) | May be used, where warranted, on high-volume, high-speed through streets at demonstrated problem locations having an unusual high concentration of pedestrians, pedestrian accident history and an identified problem of errant or unexpectant motorists. May be controlled and activated only when needed. |
| 7. Stop Signs and Markings
(Council Policy 200-08) | All-way stops may be used as an interim solution to a critical demonstrated problem involving accidents and vehicular or pedestrian rights-of-way until a traffic signal can be installed. |
| 8. Traffic Signals
(Council Policy 200-06) | May be used, where warranted, at high-volume intersections having demonstrated right-of-way safety problems involving vehicles or pedestrians. |
| 9. Separation Structures
(Council Policy 800-01) | May be used, where warranted, at intersections or mid-block locations having concentrations of pedestrians and vehicles, both subject to unreasonable delays or risk of accidents. |
| 10. Shared Pedestrian/
Vehicle Facilities | May be used in special cases to accommodate both pedestrians and vehicles on short sections of streets, cul-de-sacs, parking malls or similar sites serving very low speed, low-volume, non-through traffic in commercial, residential or recreational areas as part of a pedestrian-oriented enhancement project. |

MARKED PEDESTRIAN CROSSWALKS

Purpose

CP-200-07

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

The purpose of a marked crosswalk is to indicate to the pedestrian a preferred route of travel to cross either a street or a complex intersection. The purpose of this warrant is to establish minimum criteria for the installation of marked crosswalks so that they may provide the greatest possible benefit to both pedestrians and motorists at intersection and mid-block locations. (NOTE: For school crosswalks see "School Pedestrian Safety Devices and Warrants" per Council Resolution No. R-251799)

Legal Definitions and Right-of-Way Control

The following excerpts from the California Vehicle Code and the San Diego Municipal Code are pertinent to these warrants:

CVC 275. "Crosswalk" is either:

- (a) That portion of a roadway included within the prolongation or connection of the boundary lines of sidewalks at intersections where the intersecting roadways meet at approximately right angles, except the prolongation of such lines from an alley across a street.
- (b) Any portion of a roadway distinctly indicated for pedestrians crossing by lines or other markings on the surface.

CVC 21950. Right-of-Way at Crosswalks:

- (a) The driver of a vehicle shall yield the right-of-way to a pedestrian crossing the roadway within any marked crosswalk or within any unmarked crosswalk at an intersection, except as otherwise provided in this chapter.
- (b) The provisions of this section shall not relieve a pedestrian from the duty of using due care for his or her safety. No pedestrian shall suddenly leave a curb or other place of safety and walk or run into the path of a vehicle which is so close as to constitute an immediate hazard. No pedestrian shall unnecessarily stop or delay traffic while in a marked or unmarked crosswalk.

General

In the past, one of the major functions of the marked crosswalk was considered to serve as a warning device to motorists. A study* by Robert Utter of the University of California showed that a greater number of motorists tended to yield to pedestrians in marked vs. unmarked crosswalks. However, in spite of this improvement, a significant percentage (38.2%) of the motorists failed to yield at all. Subsequent studies indicated that many motorists not only fail to perceive and react to crosswalks, but fail to see pedestrians in time to avoid a collision. Since some motorists are unable to avoid hitting pedestrians in well-marked, well-illuminated and well-defined crosswalks, it would appear that the responsibility for avoiding a collision lies at least as much with the pedestrian as

with the motorist.

In general, marked crosswalks have the following advantages and disadvantages:

A) Advantages

1. May help pedestrians orient themselves and find their way across complex intersections.
2. May help show pedestrians the shortest route across traffic.
3. May help to show pedestrians the route with the least exposure to vehicular trafficker and traffic conflicts.
4. May help position pedestrians where they can be seen best by oncoming traffic.
5. May help utilize the presence of luminaires to improve pedestrian nighttime safety.
6. May help channelize and limit pedestrian traffic to specific locations.
7. May aid in enforcing pedestrian crossing regulations.
8. May act in a limited manner, as a warning device and reminder to motorists travelling at low speed, that this is a location where pedestrian conflicts can be expected.

* "The Influence of Painted Crosswalks on the Behavior of Pedestrians and Automobile Drivers", Robert F. Utter, University of California, Berkeley, June 1949.

B) Disadvantages

1. May cause pedestrians to have a false sense of security and to place themselves in a hazardous position with respect to vehicular traffic.
2. May cause the pedestrian to think the motorist can and will stop in all cases, even when it is impossible to do so.
3. May cause a greater number of rear-end and associated collisions due to pedestrians not waiting for gaps in traffic.
4. May cause an increase in fatal and "serious injury" accidents.

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

5. May cause an increase in community-wide accident insurance rates.
6. May cause a disrespect for all pedestrian regulations and traffic controls.

Unwarranted and poorly located marked crosswalks may cause an increased expense to the City taxpayers for installation and maintenance costs which may not be justified in terms of improved public safety.

Controlled Intersections

At controlled intersections, the signals and all-way stop signs are the major factor controlling both the motorist's and pedestrian's behavior, rather than crosswalk markings. At such intersections, there is no evidence that marked crosswalks help or hinder pedestrian safety. Consequently, the warrants (listed on pages 22 through 25) do not apply at controlled intersections. At such intersections, limit lines and stop bars help to define pedestrian paths and are a factor that the engineer may consider in deciding whether or not to mark the crosswalk. However, when pedestrian prohibition signs are posted on one or more legs, the alternate crossing routes should be defined by marked crosswalks.

A) Traffic Signals

Crosswalks at existing intersections are usually defined by limit lines. It is the current practice at new signalized intersections to install marked pedestrian crosswalks except where pedestrian traffic is prohibited.

B) All-Way Stops

All-way stops provide stop bars to guide the pedestrian across the street. The use of marked crosswalks is considered unnecessary, and they should not be used except in unusual situations.

Mid-Block Crosswalks

A marked mid-block crosswalk may be installed if it meets the crosswalk warrants and satisfies the following conditions: the length of the block between intersections should be no less than 600 feet; there must be a reasonable demand by pedestrians to cross within a concentrated area no less than 300 feet from the nearest intersection; there should be a high pedestrian volume generator nearby. Marked mid-block crosswalks may also be helpful to legalize and channelize a recognized midblock flow of pedestrian traffic between signalized intersections, but should satisfy the above conditions.

Advance Signing and Pavement Markings

Advance signing and pavement markings warning motorists of the presence of pedestrian crosswalks should be

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

provided at marked crosswalk installations unless such signs or markings are determined to be ineffective or in conflict with other traffic control devices.

Curb Clearance

Adequate curb clearance (red curb) should be provided, as appropriate, to enhance pedestrian/motorist visibility at the crosswalk site.

Nighttime Illumination

Every marked crosswalk shall be provided with adequate illumination of all pedestrians utilizing the crossing. The illumination shall be designed to make the pedestrian visible to all approaching drivers under all traffic conditions during periods of normal atmospheric visibility. Under these conditions, the visibility shall be sufficient to provide safe stopping distance prior to entering the crosswalk area with allowances for normal perception, reaction and braking time.

Accident Evaluation

There are no provisions for evaluating accidents in these warrants as to either installing or not installing marked crosswalks. Intuitively, crosswalks are often considered to be safety devices. However, the accident records do not substantiate this position. Pedestrian accident studies show a disproportionate 5.7 to 1 ratio of accidents in marked vs. unmarked crosswalks. In terms of crosswalk usage, the accident ratio drops, but is still approximately 2:1 (marked vs. unmarked). Evidence suggests that this unfavorable accident record is due to a less cautious pedestrian attitude when they use marked crosswalks. Further evidence suggest that the more aggressive pedestrian behavior in marked crosswalks may also cause an increase in rear-end collisions. Therefore, the benefits of installing a new crosswalk should always be weighed against a potential increase in traffic accidents.

Special Conditions

Marked crosswalks may be installed at the discretion of the traffic engineer, in special circumstances (for example, to clarify pedestrian routes for sight-impaired pedestrians), but such crossing must always meet the basic warrants including pedestrian volume, approach speed, visibility and illumination. In addition, the following questions should be addressed:

- (a) Will the proposed installation produce the desired results in terms of safety and mobility for both pedestrians and the drivers?
- (b) Will the proposed installation have the credibility, acceptance, and compliance by pedestrians and drivers?

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

Other techniques should be considered to enhance the pedestrian crossing site to improve pedestrian safety and mobility, such as narrowing the road width with bulbs or extensions into the parking lane, reducing approach speeds by narrowing the lanes and use of tactile rumble strips or Botts dots (see also Table II, page 15).

Future Needs

In the planning of new developments these warrants may be based on projected conditions reasonably expected to occur upon completion of the planned project. Such crossings must meet all of the basic warrants, including approach speed, visibility and illumination.

If possible, planned developments should minimize conflicts between pedestrians and motorists, and should place special attention on providing for pedestrian safety and mobility, including access for disabled persons. In addition, the following questions should be addressed:

- (a) Will the proposed facilities enhance community/neighborhood development goals?
- (b) Will the proposed facilities provide a pleasant pedestrian-oriented environment and encourage pedestrian use in the community neighborhood?

(At uncontrolled intersections and mid-block locations)

The following warrants are provided as a means of evaluating and determining whether marked crosswalks should be installed at uncontrolled intersections and mid-block locations. They consist of two parts: (a) basic warrants, and (b) point warrants. These warrants may be used on two-way streets, one-way streets or streets with center dividers.

In order to qualify for a marked crosswalk, a location must (a) meet all of the following basic warrants and (b) rate 16 points or more under the following point warrant system:

A) Basic Warrants

1. Pedestrian Volume Warrant

Pedestrian volume must be equal to or greater than ten pedestrians per hour during the peak pedestrian hour. Children under 13, elderly over 64 years and/or disabled persons count as 1.5 pedestrians.

2. Approach Speed Warrant

The 85th percentile approach speeds must be less than 45 MPH. The approach speeds shall be determined

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

by approved engineering speed study techniques.

3. Visibility Warrant

The motorist must have an unrestricted view of all pedestrians at the proposed crosswalk site, for a distance greater than 200 feet approaching from each direction.

Sites with grades, curves and other sight restrictive features will require special attention.

4. Illumination Warrant

Proposed crosswalk site must have adequate crosswalk lighting in existence or scheduled for installation prior to the installation of the crosswalk.

B) Point Warrants

1. Pedestrian Volume Warrant

NOTE: Children under 13, elderly over 64 years and disabled persons count as 1.5 pedestrians.

<u>Criterion</u>	<u>Point Assignment</u>	
	<u>Pedestrian Total</u>	<u>Points</u>
The total number of pedestrians crossing the street under study during the peak pedestrian hour. This includes pedestrians in both crosswalks at an intersection.	0-10	0
	11-30	2
	31-60	4
	61-90	6
	91-100	8
	Over 100	10
	Maximum	10

2. General Condition Warrant

	<u>Points</u>
(a) Will clarify and define pedestrian routes across complex intersections	2
(b) Will channelize pedestrians into a	2

CITY OF SAN DIEGO, CALIFORNIA
COUNCIL POLICY

CURRENT

significantly shorter path.

- | | | |
|------------|--|---|
| (c) | Will position pedestrians to be seen better by motorists. | 2 |
| (d) | Will position pedestrian to expose him/her to fewer vehicles. | 2 |
| (e) | Will legalize mid-block crossing where justified, between adjacent signalized intersections (see "midblock crosswalks" on page 19) | 2 |
| (f) | Is located within a PCOZ*-zoned area | 2 |
| (g) | Other factors | 2 |
| Maximum 14 | | |

*PCOZ = pedestrian/commercial overlay zone

3. Gap Time Warrant

<u>Point Assignment</u>		
Average number or gaps per five-minute period		
<u>Criterion</u>	<u>minute period</u>	<u>Points</u>
The number of unimpeded vehicle time gaps equal to or exceeding the required pedestrian crossing time in an average five minute period during the peak vehicle hour.	0 - 0.99	10
	1 - 1.99	8
	2 - 2.99	6
	3 - 3.99	4
	4 - 4.99	2
	5 or over	<u>0</u>
	Maximum	10

Computations

(1) Pedestrian Crossing Time = $\frac{\text{Street width curb-to-curb}}{4.0 \text{ feet per second}}$

(2) Average Number of Gaps per Five-Minute Period

$$\frac{\text{Total usable gap time in seconds}}{\text{Pedestrian Crossing Time} \times 12}$$

Discussion

Ideally, pedestrians should not have to wait in excess of three minutes to cross a street. The gap time warrant takes into account street width, pedestrian crossing speed (four ft/sec), traffic volume and the observation that pedestrians are much more cautious when crossing in heavy traffic. Points assigned if there are less than five (5) usable crossing gaps per five-minute period.

- (a) The above criterion is based on a one-hour field survey consisting of twelve five-minute samples.
- (b) All roadways having a raised median or painted median (four-foot minimum width) will be considered as having two separate roadways, if the pedestrian has a protected place to stand out of the path of traffic.

HISTORY:

"Installation of Parking Facility Guide Signs"

Adopted by Resolution R-171103 05/31/1962

Repealed by Resolution R-212199 12/12/1974

"Comprehensive Pedestrian Crossing Policy"

Adopted by Resolution R-275560 04/23/1990